# **CALFED End of Stage 1 Report**

# **April 2007 Working Draft**

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# **Executive Summary**

In August 2000, the CALFED Record of Decision (ROD) for the Programmatic Environmental Impact Statement and Report laid out 30-year plan to meet program objectives. A major feature of the ROD was to begin program implementation with a Preferred Program Alternative that included through-Delta conveyance to move water to the state and federal project export pumping facilities. The ROD also provided for reevaluation of this method for conveying water from the Sacramento River to the south Delta export pumps if the program was not on a path to achieve its objectives.

CALFED agencies completed this assessment of implementation during Stage 1 (first 7 years) of the Program and reached the following conclusions and recommendations.

#### **Conclusions**

- Preferred Program Alternative Cannot Meet Program Objectives CALFED agencies have assessed program progress and likely future conditions, and have concluded that it is not possible for the CALFED Preferred Program Alternative that includes through Delta conveyance to meet Program objectives. The continued pelagic organism decline (POD), existing hazards to Delta levees, and projected future conditions that will further jeopardize Delta levees are prime reasons for reaching this conclusion.
- Analysis of Alternative Conveyance is Needed The configuration of Delta levees and channels and their use for Delta water conveyance have a major impact on the Delta's ecosystem, water quality, and water supply reliability. An analysis of alternative layouts and operations for Delta conveyance is needed.
- **Program Objectives Need Reevaluation** The need for improved water quality, ecosystem, water supply reliability, and levee system integrity remain as strong today as it did at the time of the ROD's signing in August 2000. However, an analysis of alternative conveyance should include a reevaluation of Program objectives to determine if they are still best served by the actions outlined in the ROD.

#### Recommendations

Based on the assessment of Stage 1 described above, CALFED implementing agencies have developed the following recommendations for the Program:

- 1. **Prepare Programmatic Analysis** CALFED implementing agencies should immediately begin a programmatic analysis of the CALFED Preferred Program Alternative that specifically focuses on alternatives for Delta conveyance and its relationship to the CALFED objectives.
- 2. **Prepare Site Specific EIS/EIR(s)** CALFED agencies should prepare new site specific EIS/EIRs to reflect proposed changes within the Delta identified in the programmatic analysis.

- 3. **Conduct Focused Research** CALFED Science Program should continue focused research on Delta issues to narrow uncertainty so the best information is available in making decisions regarding the Delta.
- 4. **Proceed with Priority Stage 2 Implementation -** CALFED agencies should refine the priorities for Stage 2 presented in this report and revise program plans so appropriate, high priority, implementation can progress for all program elements during the interim period, until the selected Delta conveyance method is constructed.

#### Stage 2

Stage 2 of the CALFED Program will be the period of time necessary to prepare environmental documentation, design and construct major facilities, including Delta conveyance, upstream water storage, and other modifications to the Delta's configuration. Based on the time required to move from concept through construction of any major facility, CALFED agencies expect Stage 2 to last 10 to 15 years.

One of the most important considerations for Stage 2 is the recognition that many other actions need to continue while the configuration for the Delta is being established. In essence, Stage 2 is the interim period of time until the new Delta configuration and its conveyance method is ready for operation. Given the long duration of Stage 2, CALFED agencies cannot afford to withhold other important investments while waiting for Delta conveyance-related construction to be completed.

Priorities for the beginning of Stage 2 include:

- Initiate Programmatic Analysis This action would identify the preferred conveyance alternative which best addresses water quality, ecosystem restoration, water supply, and levee system integrity goals. However, related actions may need to be adjusted to best work with the selected conveyance method.
- Implement Priority Actions Outside the Delta Some actions outside the Delta are of high importance, regardless of the method of Delta conveyance. Actions such as habitat restoration on Battle Creek, restoration of the San Joaquin River and water use efficiency and recycling should continue.
- Implement Priority In-Delta Actions Some actions in the Delta are of high importance, regardless of the method of Delta conveyance. Actions such as new tidal marsh habitat, a lower San Joaquin River flood bypass or a Franks Tract designed for flexible operations would be useful with any method of Delta conveyance and configuration.
- Improve Program Monitoring, Tracking, and Reporting The Program will implement a new system to provide accurate and complete accounting of investments and document what was achieved with those investments.

The remainder of this report provides background on the CALFED program and more information on the Stage 1 assessment, its conclusions, and priorities for Stage 2. The actions implemented during Stage 2 will define the character of the Delta for Stage 3, the operations stage of the ROD, for decades to come.

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**Appendices** 

[include as needed]

# 1. Introduction CALFED Background

Since 1995, California and federal agencies have worked with stakeholders to develop and begin implementing a long-term program for improving resource conditions in the San Francisco Bay/Sacramento-San Joaquin Delta. The purpose of the CALFED Bay-Delta Program was to achieve four interrelated objectives:

- Provide good water quality for all beneficial uses.
- Improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species.
- Reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system.
- Reduce the risk to land use and associated economic activities, water supply, infrastructure and the ecosystem from catastrophic breaching of Delta levees.

In August 2000, the CALFED Record of Decision (ROD) for the Programmatic Environmental Impact Statement and Report laid out a 30-year plan to meet program objectives. The Preferred Program Alternative consists of a through-Delta conveyance approach, coupled with ecosystem restoration, water quality improvements, levee system improvements, increased water use efficiency, improved water transfer opportunities, watershed restoration, and additional surface and groundwater storage. Implementation of many of these program elements is influenced by and depends on the configuration of Delta water conveyance. A major decision of the ROD was to begin program implementation with a through-Delta conveyance to move water across the Delta to the State and Federal project export facilities.

The ROD acknowledged the need for adaptive management to allow the program to be refined as new information becomes available over the 30-year plan implementation period. Due to the complexity of the system, the ROD provided for evaluation of program accomplishments at the end of Stage 1, the first 7 years of implementation. Specifically, the ROD provided for reevaluation of the method for conveying water from the Sacramento River to the south Delta export facilities if the program was not on a path to achieve its objectives.

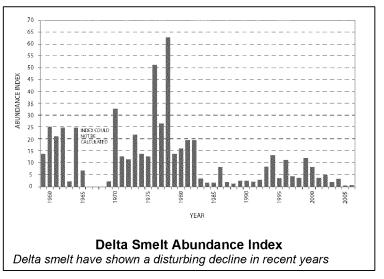
The CALFED agencies have invested about \$2.5 billion and stakeholders have invested many \$ billion more in a wide variety of actions within the Delta, in the upstream watersheds, and in the water service areas, primarily in the Bay Area and southern California. The program has made significant progress in some areas and has fallen short in others. Available funding for program actions was lower than expected which has placed many parts of the program behind schedule.

One of the most significant disappointments over the past 7 years was the further decline in parts of the ecosystem. Although pelagic (open water) organisms were at relatively low levels at the time of the ROD, they have continued to decline in abundance and have reached record low levels in recent years. In addition, new evidence suggests that the

Delta is at risk from several future conditions such as sea level rise, more winter flooding, invasive species, land subsidence, earthquakes, and population growth. These factors will make it increasingly difficult to successfully manage the Delta in its current configuration for its current uses.

Within the past several years, concerns about the Delta

have led to an unprecedented level of political, public, and funding support. This support stems from what many believe is a system that is not functioning properly. Although water exports have reached record levels in recent years, the ecosystem continues to have problems and the levee system is at risk of failure. The Legislature is particularly interested in the health of the Delta and periodically drafts new bills aimed at its sustainability. Assembly Bill



\*\*\*photo of delta smelt\*\*\*

Delta smelt have no sport fishing or commercial value, but are thought to be an indicator of ecosystem health

1200 (Laird, 2005) requires "the Department of Water Resources to evaluate the potential impacts on water supplies derived from the Sacramento-San Joaquin Delta resulting from subsidence, earthquakes, floods, changes in precipitation, temperature, and ocean levels, and a combination of those impacts." Hurricane Katrina and the resulting damage to the Gulf Coast, and especially flooding in New Orleans, provided a vivid reminder about the vulnerability of Delta levees and the possible statewide and national impacts of catastrophic levee failures. In November 2006, California voters entrusted DWR with about \$5 billion in new bond funds for flood management, a portion of which will be available for the Delta.

## **Purpose**

This report provides an assessment of Stage 1 (first 7 years) implementation and prepares the CALFED program to move into Stage 2 (approximately the next 10 to 15 years). The assessment is conducted by evaluating how well the program is achieving the 4 objectives based on Stage 1 progress and by evaluating whether the Preferred Program Alternative can meet these objectives in the future if implemented as outlined in the ROD.

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The ROD began the first 7 years of program implementation with some uncertainty about the effectiveness of the Preferred Program Alternative, mainly concerning the through-Delta conveyance. The ROD concluded that until additional information is available to determine whether water quality objectives and fish recovery goals cannot be met, the Preferred Program Alternative is the best alternative to begin implementation while establishing a process for obtaining additional information. The ROD indicated that additional actions may be necessary to achieve the CALFED objectives. The ROD stated, "If the Program purposes cannot be fully achieved with the actions proposed in the Preferred Program Alternative, additional actions including an isolated conveyance facility will need to be considered in the future."

Although this report provides an assessment of the Stage 1 implementation, it more importantly sets a direction for the next stage of implementation.

## **Historical Perspective**

An understanding of some key historical conditions in the Delta can provide useful perspective while evaluating program performance. Appendix provides more historical information.

The Delta has always been a very dynamic place. About 20,000 years ago, sea levels were about 400 feet lower then they are today and the coast line was near the Farallon Islands, about 30 miles west of the Golden Gate and about 80 miles west of the present Delta. About 130,000 years ago, sea levels were as much as 10 feet higher than they are today. During these dramatic swings, the Delta would have existed in its current location only at times when sea level was near the present day level.

The rich organic peat soils in the Delta and Suisun Marsh built up over the last 5 thousand years as the sea level rose and as marsh plants grew and died in the swampy environment. Because the land was waterlogged and anaerobic (devoid of oxygen), organic soils accumulated faster than they could decompose, forming large expanses of peat soil. The Delta and Suisun Marsh consisted of hundreds of miles of tidally influenced sloughs and channels, and hundreds of thousands of acres of marsh and overflow land. The braded channels surrounded many natural islands. The river systems accommodated large populations of anadromous fish that passed through and spent parts of their lives in the Delta.

In the 1850s, farmers began to recognize the great potential of the rich Delta soils. Natural levees existed along some river channels where sediments had been deposited when high water overflowed the channel banks. Farmers began to reclaim the land areas to grow crops by building small levees, 3 to 5 feet high, on the tops of the natural levees. High water periodically caused these levees to fail and some were rebuilt only to fail again. Large-scale reclamation of the Delta for agriculture began in 1868. By 1900, most of the lands with mineral-organic soils had been reclaimed. With the exception of Bouldin Island, lands with peat soils in the central Delta were generally not reclaimed until later. Between 1900 and 1920, lands in the Delta's interior were reclaimed. These lands contain mostly peat soils that make levee construction difficult because of their high organic matter.

With the construction of levees and draining for agriculture, the peat soils were exposed to the atmosphere. Some soil has blown away with the wind and some has burned, but the major portion has simply decomposed. The aerobic (oxygen rich) condition favors microbial oxidation, which consumes the peat soils. Most of the carbon loss is emitted as carbon-dioxide gas to the atmosphere. Today, as much as half of the original soil volume accumulated over 5,000 years has disappeared, placing much of the Delta 15 feet or more below sea level. Many of the Delta islands and tracts have flooded more than once. Since 1900, levee failures have flooded Delta islands and tracts 166 times and some remain flooded today.

Many of the levees are considered relatively fragile with respect to today's design and construction standards. About a third of the Delta levees are part of the Sacramento River Flood Control Project and eligible for US Army Corps of Engineers support for rehabilitation. In the 1970s, the California Legislature recognized that Delta levees benefit many segments and interests of the public and approved a preservation plan. The Delta Levee Maintenance Subventions Program (Subventions Program) was established in 1973 and amended by the Delta Flood Protection Act of 1988. The Delta Flood Protection Fund was created to provide for local assistance under the subventions Program and for Special Delta Flood Protection Projects (Special Projects).

Water development has significantly shaped the inflows to the Delta. Construction of upstream dams has generally lowered peak flows and increased dry weather flows to the Delta. By 1939 the federal government had initiated construction on the Central Valley Project's (CVP) Friant Dam, Shasta Dam, and Contra Costa (Delta) Divisions. The Delta acts as the hub around which the CVP revolves. The Delta Division contains the C.W. "Bill" Jones Pumping Plant (formerly Tracy Pumping Plant) and other facilities that transfer water from the Sacramento River, for uses south of the Delta. The pumping plant has a total capacity of 4,602 cubic feet per second. Work continued on the CVP for many years, with Trinity Dam completed in 1962, San Luis reservoir completed in 1967, and New Melons Reservoir completed in 1978.

In 1967, the State completed Oroville Dam and reservoir project, the major storage reservoir for the State Water Project (SWP). Construction of the Delta facilities began in 1963 and included Clifton Court Forebay, the Harvey O. Banks pumping plant and San Luis Reservoir. The initial capacity of the Banks pumping plant was 6,400 cfs later expanded to 10,300 cfs in 1991, although diversion into Clifton Court Forebay is still limited to 6,680 cfs at most times. Today, about one-quarter of California's drinking water is diverted from the Delta and approximately 3 million acres of agricultural land gets a portion of its irrigation water from the Delta.

Since development within the Delta system began, operation and management of the system has continually evolved in an effort to better address system needs, environmental impacts, and conflicts between the numerous beneficial users of the system. Some of these requirements include biological opinions of the fishery agencies, coordinated operating agreement, incidental take limits for special status species, export limits, export/inflow ratios, minimum Delta outflow, minimum river flows, pulse flows, Delta Cross Channel Gate settings, San Joaquin River Salinity, Suisun Marsh salinity, position of salinity intrusion into the Delta, and water quality requirements to name a few.

#### Conflict Leading to the 1994 Delta Accord

North-south divisions within California politics have always played an important role in the conflicts over water, as most of the water in the state falls in the north, while most of the people and demand for water is in the south. This conflict came to a head in 1982, when California voters defeated the Peripheral Canal, a plan to allow the CVP and SWP to divert water directly from the Sacramento River and carry it around the Delta to the export pumps.

Without the canal, the CVP and SWP continued to divert water from the South Delta, and these diversions increasingly became the focus of legal and regulatory battles. In 1978, the State Water Resources Control Board (SWRCB) issued Decision-1485, establishing water quality standards for the Delta and requiring the CVP and SWP to meet these standards. In 1985, EPA declared D-1485 inadequate under the Clean Water Act. In 1991, SWRCB issued a new Delta salinity plan which was also rejected by EPA.

Also in 1991, the winter-run Chinook salmon was listed as threatened under the Endangered Species Act (ESA), and restrictions on CVP and SWP pumping were imposed, sometimes halting exports completely during peak irrigation times. Also in 1993, the Governor rejected the SWRCB's latest attempt to set Delta water quality standards (D-1630).

By 1994, Governor Pete Wilson became increasingly concerned about the declining state of the Delta ecosystem, the increasing uncertainty associated with Delta water supplies for urban and agricultural uses, and the increasing amount of rancor and litigation surrounding SWRCB's unsuccessful 16-year effort to establish Delta water quality standards. He led an effort to bring together the numerous federal and state agencies with responsibilities in the Delta, and stakeholder representatives to work toward a resolution of the conflicts over the Delta. In December 1994, the Delta Accord was signed which set interim water quality standards and established the CALFED Bay-Delta Program to develop a long-term solution for the Delta.

History suggests that many of the operation and management adjustments have fallen short in addressing the environmental or water quality concerns these actions were designed to resolve.

## **Changing Conditions**

There are several factors that will affect how the Preferred Program Alternative can perform in the future. These are factors like forces of nature over which there is little human control, or factors for which there is no single oversight given existing regulatory and management practices.

## Global Climate Change - Sea Level Rise

Over the last 100 years, the sea level at California's Golden Gate has been rising by an average rate of about 0.08 inches per year and now sits about 0.6-foot higher than it did in 1920. Recent scientific evidence suggests the trend to warmer global temperatures will accelerate melting of glaciers, which will release more water into the oceans. In addition, warmer ocean temperatures cause the water to expand, further raising the sea level. Different assumptions about future greenhouse gas emissions and use of different models lead to different estimates of likely sea level rise in the 21<sup>st</sup> Century. Current estimates by the Intergovernmental Panel on Climate Change indicate that sea level will rise by about 0.6 foot to 1.9 feet over the next 100 years, with a possible added 0.5 foot if the rate of Greenland ice melt increases. Before reclamation, the Delta could naturally expand and contract to adjust to sea level changes. In its current configuration, the Delta is unable to self-adapt to sea level rise because its levees have fixed the channel and island locations

in place. Because the Delta is tidally influenced, water will become saltier, especially in the western Delta.

#### Regional Climate Change - More Winter Flooding

California's climate is expected to become warmer during this century. By the end of the century, depending on future heat trapping emissions, statewide average temperatures are expected to rise between 3 and 10.5°F. Increases in water temperature may hurt spawning and recruitment success of native fishes. Storms are likely to become somewhat more intense with higher snow lines causing more winter precipitation falling in the mountains as rain rather than snow. Average winter flows to the Delta are likely to become larger in the future which can cause more flooding. The change in rain/snow mix, particularly in the northern Sierra Nevada, is predicted to shift the timing of peak runoff in the Central Valley earlier toward the winter. This would potentially lead to declines in spring and summer inflows and increasing salinity, most notably in the western Delta. If there is an effort to maintain current water quality standards, more water will be required to be released from upstream reservoirs to flush salt from the Delta, leaving less water for water supply. In addition, increased storm intensity from climate change may require adjustments to flood control reservations.

#### **Seismic Activity**

The Delta-Suisun lies in proximity to six major faults that are capable of generating moderate to strong ground shaking, particularly in the western Delta. Liquifaction of foundation sands during a moderate to strong earthquake has the potential to fail many miles of Delta levees, none of which were designed or constructed to current day seismic standards. It is likely that an earthquake leading to multi-island flooding will occur within the western Delta during this century. Some of the islands could remain permanently flooded because it may not be practical to recover all islands. All preliminary modeling indicates that Delta flooding will lead to salt water intrusion into the Delta during seasonal low inflows. Multiple flooded islands and increased seasonal salinities will significantly alter the distribution, type, and quality of habitat along with abandonment of certain land use activities and infrastructure and change in water supply reliability.

#### **Introduced Species**

All aspects of the ecology of the Delta have been significantly and, in most cases, irrevocably altered by introduced (non-native) species. The effects of most introduced species on the Delta ecosystem are unknown. Some introduced species are also invasive: they spread rapidly, take over habitats, and displace natives. Among the introduced species of the Delta, the most visible is the aquatic weed *Egeria*, which can choke low-velocity channels in the central and southern Delta. Two clams from Asia dominate the benthos of the Delta: *Corbicula* is most abundant in freshwater and the overbite clam *Corbula* is abundant in brackish to saline water. These clams have substantial effects on the pelagic foodweb by filtering food from the water. Striped bass and largemouth bass, both deliberate introductions, are not only among the most abundant fish of pelagic and nearshore habitats, they are also predatory and probably have significant negative effects on natives. There is a growing sense among scientists that the present day relatively uniform salinity conditions in the Delta may benefit introduced species at the expense of

natives. The possibility of another harmful species being introduced into the Delta is too high to ignore. Such introductions could eliminate gains occurring through restoration or improved management.

#### **Subsidence**

Current Delta agricultural practices require an aerated root zone for crop production and therefore promote land subsidence. Land subsidence, primarily through microbial oxidation, has placed most of the Delta land below sea level, some as much as 15 feet or more. The dramatic reduction of land elevation on Delta islands has increased the differential between land and the water surface elevations in the channels. Over the next 200 years, some areas, especially in the central Delta, could subside by another 18 feet from existing land levels if current land use practices continue. Land uses such as permanently flooded wetlands or flooded agricultural lands can stop subsidence and even begin to rebuild the soil. The potential consequence of levee failures and catastrophic island flooding has major implications for management of the Delta. The lower land surface provides more room for inflowing salt water from Suisun Bay when a levee failure occurs.

#### **Population Growth and Urbanization**

Population forecasts indicate that California's population may reach 90 million residents by 2100. As noted in the California Water Plan Update 2005, this growth in population will change the nature and timing of demand for water resources, directly and indirectly influencing the future of the Delta. The Department of Finance estimates that the combined population of the six Delta-Suisun counties will grow from about 3,300,000 in 2000 to about 7,700,000 in 2050, and increase of over 130 percent. Population growth within the Delta, in the surrounding area, and in the state will place more demands on the Delta. More people will mean more need for recreation, transportation, utilities, water supply, and urban runoff as examples. Urbanization not only removes land from agriculture and other open space uses, but limits future management options in the Delta because the land is no longer available for other uses. Ongoing urban encroachment and levee improvements along the southern and eastern margins of the Delta limit the opportunity for future adjustments to Delta management strategies, such as a San Joaquin River flood bypass, needed for the changing conditions.

# 2. Stage 1 Assessment

Stage 1 covers the first 7 years of a 30-year program consisting of hundreds of actions. For example, the Ecosystem Restoration Program alone identified over 600 programmatic actions. The CALFED agencies recognized that the entire 30-year program was too long without some assessment and redirection along the way. Stage 1 was intended to begin program implementation and build a foundation for long-term actions. The CALFED agencies selected the initial 7-year time period as a reasonable period for progress to be made towards the program objectives. It was long enough to allow time for implementing some key actions and allowing the system time to begin to respond to these actions. For example, 7 years provided time to implement some ecosystem restoration actions in streams upstream from the Delta, and enough time for a few generations of salmon to benefit from those actions.

Assessing program progress on a program as complex as CALFED is not an easy task. There will always be questions on how progress for the first 7 years relates to ultimately achieving the program objectives after 30 years. The following assessment uses the best available information to measure progress during the first 7 years, and likelihood of future progress, towards meeting the program objectives.

#### **Approach**

An assessment of Stage 1 could take several forms. Rather than individually considering each of the hundreds of programmatic actions identified in the ROD, this assessment focuses on the 4 objectives by providing answers to 3 questions:

- Stage 1 Progress How well has Stage 1 implementation moved the program towards achieving the 4 program objectives?
- **ROD Implementation** Is it likely that the 4 program objectives will be achieved if the Preferred Program Alternative is fully implemented as envisioned by the ROD?
- **ROD Implementation with Future Conditions** Is it likely that the 4 program objectives will be achieved with the Preferred Program Alternative given the changing conditions?

The Preferred Program Alternative is comprised of many interrelated parts with actions identified for implementation through much of California. While all these parts influence the success of the program, the form of Delta conveyance plays a disproportionately large role because of its influence on water flow in Delta channels. The ROD recognized the role of Delta conveyance in the overall success of the program. The ROD also recognized the uncertainties surrounding Delta conveyance when it called for a reevaluation by the end of Stage 1. Therefore, the answers to these 3 questions revolve around the performance of the Preferred Program Alternative using the through-Delta conveyance. As such, several of the assessments include a discussion about conveyance's role in meeting the objective.

The following sections provide an overview of information to assess past and likely future program progress towards meeting the 4 program objectives.

## **Water Quality**

The CALFED objective for water quality is to provide good water quality for all beneficial uses. It may be possible to meet ecosystem water quality objectives with the Preferred Program Alternative. Water quality for in-Delta agricultural use is likely to get saltier with the Preferred Program Alternative as sea levels rise. Based primarily on the risks to drinking water quality from the vulnerability of Delta levees to failure and the potential for salt water intrusion, CALFED agencies believe that it is not possible to meet the water quality objective for drinking water with the Preferred Program Alternative identified in the ROD.

#### Stage 1 Progress

The ROD called for the Preferred Program Alternative to meet Delta source water of not more that 50 parts per billion (ppb) of bromide and 3 parts per million (ppm) of total organic carbon, or achieve equivalent level of heath protection (ELPH) by a variety of water quality improvements. The level of bromide in the Delta water, heavily influenced by sea water, typically exceeds the ROD goal by several times. The alternative ELPH goal is much more difficult to quantify. Following is a summary of Stage 1 progress towards meeting the water quality objective:

- During the first 5 years of program implementation, the actual funding for the drinking water quality program was less than 20 percent of expected funding. During the past two years, funding for the water quality program has been even lower.
- Although drinking water quality regulations in the Delta are being met, there is no long-term indication that in-Delta water quality is getting better or worse
- A pilot project at the Stockton Deepwater Ship Channel shows promise of improving dissolved oxygen in the water for aquatic species
- A project at Frank's tract and changes in operation of Delta Cross Channel gates show potential to lower salinity levels at the export facilities
- The 50 ppb of bromide is impractical with a through-Delta conveyance facility given the tidal action that brings saltwater including bromide into the Delta
- Although ELPH has not been numerically defined, CALFED's focus on source water quality and water treatment improvements has contributed towards ELPH
- The water quality needs for the drinking water are often in conflict with water quality needs for the ecosystem; the ecosystem could benefit from higher and more variable salinity while drinking water benefits from lower and more stable salinity; the ecosystem could benefit from more turbid water and total organic carbon while drinking water benefits from the opposite as examples.
- The program learned more about placement of shallow water habitat and the resultant generation of organic carbon; careful placement can minimize the chance for increasing organic carbon loads for water reaching the export pumps

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• The awareness of human health risk from drinking water is increasing

 Due to changes in drinking water quality regulations, new water treatment processes have improved drinking water quality at the tap. This was achieved by expenditures of local agencies beyond that identified for the drinking water quality program.

Appendix includes additional information of the Stage 1 progress. Except for improved dissolved oxygen in the San Joaquin River near Stockton, ecosystem water quality has not improved. In-Delta water quality for agricultural use remains about the same as at the time of the ROD. Although source water quality remains about the same, drinking water quality at the tap for water withdrawn from the Delta is much better than at time of the ROD due to major investments by the water agencies.

#### **ROD Implementation**

Conveyance improvements with through-Delta facility and Delta Cross Channel Gate operations envisioned by the ROD would lower salinities in the central and south Delta for in-Delta agriculture and further improve source water quality for water diverted/exported from the Delta. The Franks Tract, initially envisioned as an ecosystem project, was later recognized for its potential to lower export salinity. Studies have indicated that the combination of these three projects could lower bromide by about 10 percent at times. However, implementation of the Preferred Program Alternative is unlikely to meet bromide or total organic carbon goals, but would incrementally improve source water quality. Bromide at the Delta export pumps is typically 600 ppb. Although organic carbon at the export facilities typically averages about 3 ppm, it can easily spike beyond 10 ppm when there is turbidity. Given the peat soils in the Delta, it is unlikely that organic carbon can be measurably reduced. With continued expenditures on improved treatment technologies by the water agencies, the contribution towards ELPH would be further improved.

The combination of organic matter (decaying vegetation, bromide in the sea water, and disinfectants used in water treatment plants produce disinfection byproducts that have been inked to human health problems. Different disinfectants produce different types or amounts of disinfection byproducts. Future drinking water regulations are likely to become more protective of human health as health linkages to drinking water quality are better understood and as new constituents of concern are identified. This is why many drinking water experts believe that the most effective measure for achieving good drinking water quality is to use the highest source water possible and to protect that source from contamination.

Full implementation of the Preferred Program Alternative may result in some ecosystem water quality improvements from reduced pesticides and herbicides. Salinities for in-Delta agriculture would be expected to be somewhat lower than conditions at the time of the ROD. Full implementation of the Preferred Program Alternative may achieve acceptable drinking water quality based on a balance of acceptable expenditures and residual health risk, but it is unlikely that the full drinking water objective can be met with the Preferred Program Alternative. ELPH that is equivalent to 50 ppb bromide and 3 ppm total organic carbon would likely be prohibitively expensive. However, water agencies will continue to make improvements in the quality of their source waters, treatment technologies, and water distribution networks to meet future regulations.

#### **ROD Implementation with Future Conditions**

The most important source of bromide in Delta water is sea water. One future risk to the Delta as a drinking water source comes from gradual increased salinity levels due to sea level rise. Increased salinity in the Delta water reduces the opportunity to blend this water with higher salinity water from other sources. If current in-Delta water quality standards were to be maintained, re-operation of upstream reservoirs would likely be needed to provide more Delta flushing flows. This would likely result in generally lower reservoir levels which would further lower the ability to meet water supply and provide flushing flows.

A larger risk to the Delta as a drinking water source may be more catastrophic. There is increasing concern over the reliability of the Delta levees and the potential of multiple levee failures from high flows into the Delta or from a moderate to severe earthquake. If an earthquake fails multiple levees large volumes of sea water can flow through the levee breaches to flood the islands; this would be particularly bad if the failures occurred during low inflow to the Delta. To avoid exporting the higher salinity water from the Delta, export pumps will likely be curtailed or stopped. Depending on the actual levee failures, it may be impractical to recover all the flooded islands and elevated salinity problems could persist for extended periods of time.

Increased land subsidence, sea level rise, the likelihood of a moderate to severe earthquake, and the potential for larger winter floodflows (from regional climate change) to the Delta all increase the risk to the Delta levees and to the water supply. More variable salinity in the Delta may benefit the ecosystem. Considering the future conditions, salinity increases for in-Delta agriculture would likely be detrimental. Considering the future conditions, it is unlikely that the drinking water quality objective can be achieved, even with full implementation of the Preferred Program Alternative.

## **Ecosystem**

The CALFED objective for the ecosystem is to improve and increase aquatic and terrestrial habitats and improve ecological functions in the Bay-Delta to support sustainable populations of diverse and valuable plant and animal species. It appears that the ecosystem objective for areas upstream of the Delta can be met with the Preferred Program Alternative. However, based primarily on the continuing POD, invasive species, existing water operations, potential effects of toxics, and other unknown factors, the CALFED agencies believe that it is not possible to meet the in-Delta ecosystem objectives with the Preferred Program Alternative identified in the ROD.

## Stage 1 Progress

#### [add short introductory paragraph]

- The Ecosystem Restoration Plan (ERP) and the Environmental Water Account (EWA) are the main programs contributing to the ecosystem during Stage 1.
- During the first 5 years of program implementation, the actual funding for the ecosystem program met funding levels projected at the time of the ROD. During the past two years, funding for the ecosystem restoration program has been somewhat lower. It was one of the best funded programs during Stage 1.

- Most ERP program implementation related to ecological processes and in acquiring and protecting habitat (about 130,000 acres) and corridors outside of the Delta
- There has been little investment in improving streamflow or reducing other factors that stress fish, such as water diversions, invasive species, gravel mining and sediment disposal
- The greatest ecosystem investments were upstream of the Delta, which benefit primarily anadromous fish resulting in improvement in some populations of salmon
- The water quality needs for the ecosystem are often in conflict with water quality needs for drinking water; the ecosystem could benefit from higher and more variable salinity while drinking water benefits from lower and more stable salinity; the ecosystem could benefit from more turbid water and total organic carbon while drinking water benefits from the opposite as examples.
- Splittail, a native minnow, was taken off the federal threatened species list in 2003. A component of the delisting rationale was the significant benefit that CALFED restoration actions related to floodplain habitats provided this species.
- The Program has made particular progress with some environmental water quality constituents, especially in the understanding of mercury in Delta waters and in improving the dissolved oxygen problem in the Stockton Deepwater Ship Channel
- The EWA had two objectives: 1) make water supplies more reliable, and 2) protect fish. The EWA helped reach record water exports and protected fish at the export pumps, but no evidence has been found that it had an effect on increasing populations. The scientific reviews have regularly raised concern that current monitoring is not adequate to determine the effects of EWA on populations of species of concern. Plans now call for an interim (3 to 4 years) EWA to continue at a reduced level until a long-term EWA with variable assets for different year types can replace it.

Appendix includes additional information of the Stage 1 progress. At the end of Year 4 of CALFED implementation, the Biological Opinions that accompanied the ROD called for a re-initiation of consultation based on an assessment of progress towards achieving the Multi-Species Conservation Plan (MSCS) milestones and the efficacy of the EWA. The ERP agencies conducted this assessment for the member agencies and also produced an annual compliance report regarding these topics in the following two years. Based on these assessments it appears that ERP investments have targeted implementation of the milestones, but progress toward their completion is not easily assessed. The Biological Opinions included key planned actions required for meeting regulatory requirements during program implementation. The MSCS identified 119 milestones, none of which quantify expected outcome. Both the key planned actions and the milestones were designed as measures that if implemented would sustain programmatic compliance.

While there appears to be some improvement in some salmon populations the trend is not consistent. The apparent increase in populations from 2001 through 2004 has not continued and has shown reduced numbers recently. The program has made significant progress towards improving upstream habitat, but there is not a clear indication that the species are responding with markedly improved population abundance.

The Delta has been substantially, and in most cases, irrevocably altered by introduced (non-native) species. Introduced species now dominate most habitats within the Delta. For example, 88 percent of the fish captured in 2003 during juvenile fish surveys, were introduced species. In benthic sampling throughout the Delta, typically 95 percent or more of the biomass consists of introduced species. Two clams from Asia dominate the benthos of the Delta: *Corbicula* is most abundant in fresh water and the overbite clam *Corbula* is abundant in brackish to saline water. These clams have substantial negative effects on the pelagic foodweb.

Perhaps the biggest indicator that the ecosystem objective is not being met is the continued decline in the pelagic (open water) organisms. Since the ROD, these organisms have experienced a steady decline and have shown record low population numbers in the past few years. The reason for the pelagic organism decline (POD) is under investigation and there appears to be multiple contributors. The pelagic species of the Delta seem to be squeezed between poor conditions for food and water quality, losses to export pumping, and possibly other negative influences, such as toxins.

#### **ROD** Implementation

Water operations including upstream dams have generally made Delta water clearer over the past 50 years. Delta smelt typically seek out more turbid water that is getting harder to find within the salinity range that the smelt need. This habitat loss is suspected to be a major contributor to the delta smelt decline. The existing Delta configuration, introduced species, and operations make it unlikely that enough habitat (open water, correct salinity range, turbidity, etc) can be achieved to significantly reverse the POD. The majority of the ERP actions were implemented upstream of the Delta for anadromous fish and have had little effect on the POD. Most of the ERP in-Delta actions were studies for improved understanding of the Delta. The ERP did include some physical improvements such as developing shallow water habitat in the Delta, which would have been potentially beneficial to pelagic organisms. However, studies since the ROD have linked shallow water habitat in certain Delta locations with methylmercury formation, so this habitat cannot be used as extensively as envisioned. Since delta smelt only live one year, they are less affected by mercury, but other longer lived species could be negatively affected.

Most of the ROD conveyance improvements were for water quality improvement to produce lower salinity at the exports facilities. Although they would have fish protection incorporated in the designs, they would not significantly improve conditions for the fish. Even the proposed screening facilities at the export facilities were tied to actions that would increase export capacity. Due to the high costs of these screens, they have been deferred in favor of upstream restoration actions that may be more cost effective and until there is a better understanding on the effectiveness of screens for in-Delta species. Continued development of the through-Delta conveyance facilities is unlikely to improve

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conditions for the pelagic organisms. Therefore, it is unlikely that full implementation of the preferred program alternative will achieve the ecosystem objective.

#### **ROD Implementation with Future Conditions**

By definition, ecosystems are dynamic and will respond to changing conditions regardless of the cause; natural or man-made, gradual or catastrophic. However, the response may favor certain species over others. If the future conditions result in extensive levee failures, it may be impractical to recover all flooded Delta islands and tracts. In this case, the Delta ecosystem would be quite different than under today's configuration.

Studies of flooded Delta islands (Franks Tract and Mildred Island) indicate that habitat benefits of flooded islands are limited and variable. Changes in the quantities and locations for exporting water in response to permanently flooded Delta islands would also change conditions for the ecosystem. Island flooding likely will create more areas for invasive species to the detriment of native aquatic species. Changes in the ecosystem that are implemented to benefit desirable species may also have the unintended consequence of favoring new exotic species. Regardless of future plans for the Delta, there is ongoing risk of new exotic introductions. Salinity will likely be higher. If salinity becomes more variable, there may be a net benefit to native in-Delta species. Marshes may become too deep to support wetland plants and the forage and cover they provide to important species. Increased water temperatures resulting from climate change may hurt spawning and recruitment success of native species. Urbanization will cover more open space, removing it from ecosystem uses.

How well the ecosystem objective can be met in the future depends on how the future conditions influence decisions on the configuration of the Delta. On the whole, the future conditions will likely result in a different Delta ecosystem than is in place today. Some changes may be beneficial to the ecosystem and native species and some may be detrimental. As a result of changed conditions, the approach to ecosystem restoration will need to be completely reassessed.

## Water Supply Reliability

The CALFED objective for water supply reliability is to reduce the mismatch between Bay-Delta water supplies and current and projected beneficial uses dependent on the Bay-Delta system. Water supplies outside the Delta, except for portions dependent on Delta exports, can become more reliable with the Preferred Program Alternative. However, based primarily on the risks to Delta levees and the continued conflicts between the in-Delta ecosystem and water supplies, CALFED agencies believe that water supply reliability objectives for export water supply cannot be met with the Preferred Program Alternative identified in the ROD.

## Stage 1 Progress

#### [add short introductory paragraph]

• The progress towards the water supply reliability objective has been mixed. Implementation of groundwater/conjunctive use projects has already exceeded the 30 year expectation in the ROD, but no physical facilities for Delta conveyance have been constructed.

- Except for groundwater/conjunctive projects and recycling, funding for other improvements to water supply reliability been significantly lower (50 percent or less) than that envisioned at the time of the ROD.
- A 1998 study by the Natural Heritage Institute found that the inventory of potential aquifer storage sites is 10,000,000 acre-feet in various places around the Central Valley, much of which could be accessed by re-operating and modifying existing conveyance infrastructure. Applications for groundwater funding have been very strong over the past several years. In the initial round of Prop 50 IRWM grant funding, over \$4 billion in projects were proposed, far exceeding available funding. Proposals for succeeding rounds of funding also exceeded available funding. Based on the applications funded, there has been an increase of 300,000 acre-feet of yield made available to local water users. The total amount of state funding available for Integrated Regional Water Management (IRWM) is \$380 million. In addition the passage of Prop 84 ensures that at least \$1 billion in funding will be available in the future. It should be noted that the IRWM program supports many aspects of water management: watershed management, ecosystem restoration, conjunctive use, water use efficiency and water quality.
- There has been no discernable change in water supply reliability due to changes in salinity or other water quality constituents.
- Studies have shown that there is still considerable cost-effective water conservation that could be implemented. Therefore, existing water supply reliability is generally good for most water agencies or they would be implementing more of these cost-effective measures.
- Water transfers between willing buyers and sellers vary from year to year with market conditions. The overall potential for transfers through the Delta is limited due to the limited space in existing conveyance facilities to export the water from the Delta.
- Conveyance and surface storage actions have been primarily limited to investigations.
- Aided by favorable hydrology and flexible operations of the EWA, exports from the Delta have reached record levels in recent years. The California Data Exchange Center reports that on the Sacramento and San Joaquin river systems, during Stage 1 (2000 2006), there were no critical years and that four of the years on the Sacramento River and three of the years on the San Joaquin were above normal or better. Over the past seven years, the Bay-Delta system has delivered water for direct use and for storage in both surface and groundwater reservoirs.
- However, this short period of high water deliveries does not mean that water supply is reliable. Several things put the water supply reliability at risk. The ongoing POD, resulting court actions, and plans intended to begin resolving the POD raises uncertainty and have reduced the reliability of these export water supplies. Further, it is generally acknowledged that the export of water and

diversion pumping that occurs in the Bay-Delta system is one of many factors suspected of causing the POD and the absence of recovery of endangered species. This conflict reduces the reliability of the Delta water supplies.

- The EWA which has significantly contributed to the record exports, may not take the same form in the future
- In general, in-Delta water supplies continue to be reliable since Delta water demand is not expected to increase appreciably, even with changes in land use because of the high priority water rights priority in the Delta.

Appendix includes additional information of the Stage 1 progress. Questions about the effect of temporary barriers and permanent operable barriers in the south Delta on delta smelt raises questions about the reliability of some water supplies in that area. Although implementation of CALFED actions has improved water supply reliability throughout the service area, it is expected that the continued POD will reduce reduced the reliability of Delta water exports.

#### **ROD** Implementation

Within the Delta, water supplies are expected to be reliable for the foreseeable future since Delta water demand is not expected to increase appreciably, even with changes in land use because of the high priority water rights priority in the Delta. In addition, if existing water quality standards continue to be met, then the water quality will also be maintained in the future. However, as indicated in the Delta Smelt Action Plan (\*\*ref\*\*), many of the proposed actions intended to help the POD, could negatively impact the reliability of Delta exports. In particular, it appears that there are no "safe" times to export from the south Delta. Although it is probable that there is a safe-yield level of Delta exports and diversions at the current locations, this yield may not meet the demands of the urban and agricultural sectors. It is unlikely that full implementation of the Preferred Program Alternative would meet the water supply reliability objective.

### **ROD Implementation with Future Conditions**

Although record levels of water have been exported from the Delta in recent years, these conditions do not appear to be sustainable given the expected changes in sea level, the winter flooding potential, and the probability of earthquakes failing levees. In the event of a catastrophic levee failure in the Delta, salt water intrusion into the Delta could limit or shut down both in-Delta diversions and exports. The levee system integrity program and its funding did not fully anticipate the risk to the levees. A much more robust levee program than that envisioned by the ROD would likely be required to combat the future conditions. Even without levee failures, sea level rise could negatively impact water supply reliability by the increased salinity that will accompany sea level rise, or the increased use of upstream reservoir water to repel the salinity. Changes in exports may be required to lessen the impact on the POD. Therefore, the future conditions will make it increasingly unlikely that the Preferred Program Alternative can meet the water supply reliability objective.

## **Levee System Integrity**

The CALFED objective for levee system integrity is to reduce the risk to land use and associated economic activities, water supply, infrastructure and the ecosystem from catastrophic breaching of Delta levees. Based primarily on the condition of the existing levee system and the hazards that these levees face now and in the future, CALFED agencies believe that it is not possible to meet the levee system integrity objectives with the Preferred Program Alternative identified in the ROD.

#### Stage 1 Progress

#### [add short introductory paragraph]

- The Levee Program was chronically under-funded. Recent passage of significant Bond measures in 2006 should increase funding for levee actions however, the amount to be expended on Delta levees is not yet determined. However, there is some evidence that the programs have reduced the occurrence of levee failures.
- Since the ROD was completed in 2000, state and local funding has been directed toward levee maintenance as part of the Levee Subventions and Special Projects Programs. These investments have resulted in maintenance of 600 miles of eligible project and non-project levees, and 45 miles of levee improvements to the PL84-99 levee standard. Overall levee improvements have been less than 20% of those prescribed in the ROD.
- Although reuse of dredge material has provided increased levee protection and habitat restoration, it falls far short of the goal, two million cubic yards of dredged material to be reused by the end of Stage 1, noted in the ROD.
- The Delta Risk Management Strategy (DRMS) is a study being initiated as an
  outgrowth of the management program element described in the ROD. DRMS
  will include risk reduction measures that will be useful for implementation
  regardless of the configuration of the Delta. The DRMS is expected to be
  completed by January 2008.
- The Delta Long-Term Management Strategy (Delta LTMS), being prepared by the USACE, is studying the best options for the reuse of dredged material for beneficial purposes.
- In response to the CALFED Bay-Delta Authorization Act (Public Law 108-361), the US Army Corps of Engineers prepared a report that describes the levee stability reconstruction projects and priorities that will be carried out under the Act. The report provides both short- and long-term strategies to address levee stability in the Delta. No decision document will be included in this report. The report prioritizes the projects and presents the USACE long-term strategy for levees in the Delta. The study is being conducted in coordination with DRMS and the Delta Vision, and is expected to be finished by 2012.
- Funding for special improvement projects is used for improvements beyond the PL 84-99 standard only on islands with broad statewide significance. The Department of Water Resources has completed no projects of this nature and is

currently giving a high priority to funding projects that raise deficient levees on critical islands to more modest standards. The existing backlog of deficient levee sections has taken all available funding.

- In early 2004, CBDA completed a report called, "Preliminary Seismic Risk Analysis Associated with Levee Failures in the Sacramento San Joaquin Delta." This report presents the results of a preliminary seismic risk analysis to estimate the effects of seismically initiated levee failures on Delta water quality and export and the economic consequences to the state. Due to the failure of Jones Track in June of 2004, the second phase of this report evolved into what is now DRMS.
- Most of the management of the islands in the Delta depends on the individual planting strategies of the owner or operator. Some islands are managed in a way that minimizes subsidence effects. For example, the Department of Water Resources has implemented experimental sites on Twitchell Island to determine if restoring peat soils and reversing subsidence is feasible. It has been determine that the peat soils can be grown back, but the time that it would take to reach sea level elevation is in the hundreds of years. In addition, sea level rise could outpace the peat soil restoration.
- Emergency response and evacuation falls under a local jurisdiction. The state is involved for emergency operations until the local authorities have asked for assistance. Individual counties and cities have their own plans and efforts have been made to unified emergency operations.

Appendix includes additional information of the Stage 1 progress. Since the Delta levee system remain vulnerable to a number of hazards, the Preferred Program Alternative is not meeting the program objective for levees.

#### **ROD** Implementation

If the levee system integrity program could be funded at the full level envisioned in the ROD, it is likely that the levee system integrity objective could be met. However, due to the funding shortfall experienced over the past 7 years, funding remains a big question. Even with passage of Propositions 1E and 84 which would provide some funding for the Delta, it appears that the majority of the funding may be focused on urban areas.

## **ROD Implementation with Future Conditions**

Recent events such as Jones Track failure in 2004 and the failure of the levees in New Orleans in 2005 have led to a re-evaluation of the state and federal approaches to Delta levees. If the state does not adequately plan for the major changes in the Delta that are likely within the next 25 to 100 years, it will need expensive and temporary emergency measures to recover from events that cannot be controlled. Some events may result in negative impacts so great that the state will not be able to fully recover the infrastructure and ecosystems valued today. The U.S. Geological Survey and other scientists concluded that there is about a 2/3 chance of a magnitude 6.7 or greater earthquake, capable of causing widespread damage, striking the San Francisco Bay region before 2032. Analysis for the Delta Risk Management Strategy arrived at a similar estimate.

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The levee system integrity and its funding did not fully anticipate the risk to the levees resulting from earthquakes, sea level rise or increased winter flooding. A much more robust levee program than that envisioned by the ROD would likely be required to combat the future conditions. Therefore, the future conditions will make it increasingly unlikely that the Preferred Program Alternative can meet the levee system integrity objective.

# 3. Stage 1 Conclusions

The past 7 years of CALFED program implementation has provided ample time to begin implementation of the 30-year program and time for the system to begin responding to the implementation actions. The following conclusions are based on experience gained during this period.

## Preferred Program Alternative Cannot Meet Program Objectives

- CALFED agencies have assessed program progress and likely future

#### Given the three questions outlined in Section 2:

- Stage 1 Progress: The Preferred Program Alternative is not meeting the 4 program objectives.
- Rod Implementation: Full implementation of the Preferred Program Alternative would not meet the program objectives.
- Rod Implementation with Future Conditions:
  The future changing conditions make it even more unlikely for the Preferred Program
  Alternative to meet the program objectives.

conditions, and have concluded that it is not possible for the CALFED Preferred Program Alternative that includes through Delta conveyance to meet Program objectives. The continued pelagic organism decline (POD), existing hazards to Delta levees, and projected future conditions that will further jeopardize Delta levees are prime reasons for reaching this conclusion. The need for modification of some program elements does not mean that the entire Preferred Program Alternative needs to be changed. It appears that program implementation of actions outside of the Delta proper could continue regardless of the actions taken in the Delta. Therefore, most of the Preferred Program Alternative can still contribute to meeting the program objectives. However, there appears to be strong reason to reevaluate actions within the Delta.

- Analysis of Alternative Conveyance is Needed The configuration of Delta levees and channels and their use for Delta water conveyance have a major impact on the Delta's ecosystem, water quality, and water supply reliability. An analysis of alternative layouts and operations for Delta conveyance is needed.
- **Program Objectives Need Reevaluation** The need for improved water quality, ecosystem, water supply reliability, and levee system integrity remain as strong today as it did at the time of the ROD's signing in August 2000. However, an analysis of alternative conveyance should include a reevaluation of Program objectives to determine if they are still best served by the actions outlined in the ROD.
- Program Progress is Mixed The CALFED program has made some progress towards meeting its objectives, but not enough progress to warrant continuing to implement the Preferred Program Alternative exactly as specified in the ROD. Under-funding of the CALFED program during Stage 1 appears to be a partial reason for the lack of significant implementation progress and the prospect for significantly improved funding in the future is not good. In addition, new challenges have significantly limited the prospects for fully meeting the program objectives in the future.

- Understanding of Delta Hydrodynamics The CALFED program has significantly raised the understanding of Delta hydrodynamics by investigations conducted during Stage 1. Hydrodynamics determine the interaction of major parts of the Delta ecosystem, water quality, and water supply. This understanding places the program in a better position to evaluate conditions in the Delta than was available at the time of the ROD.
- Growing Concern Over Delta Sustainability There is growing recognition of the importance of the Delta as a changing, dynamic system. Within the past several years, the Delta has gained an unprecedented level of political, public, and funding support. Several events in recent years have heightened concern over the sustainability of the Delta in its current form:
  - O Although 6 Delta levees and 2 Suisun Marsh levees had previously failed during low flow periods, the June 2004 failure of a Jones Tract levee provided a reminder that the Delta levees have water against them 365 days per year and failures at any time are possible. The levee failure did not significantly affect the Delta water exports, but highlighted the risks of potential impacts if islands flood in other locations or multiple islands flood at the same time.
  - O Hurricane Katrina and the resulting damage to the Gulf Coast, and especially flooding in New Orleans, was on the front pages of newspapers and on the evening news for weeks during August 2005. The public, politicians, and scientists and engineers became concerned about potential parallels between flooding in New Orleans and potential flooding in the Delta. While this wasn't necessarily a new lesson, it was a vivid reminder about the vulnerability of Delta levees and the possible statewide and national impacts of catastrophic levee failures.
  - Although climate change is not a new concept, it has received wide attention since the turn of the century. California's climate is expected to become warmer during this century. Estimates indicate that there will be more winter rain and less snow in the mountains, leading to more downstream flooding. Sea levels will continue to rise. Both these pose significant threats to the Delta levees.
  - On the basis of research conducted since the 1989 Loma Prieta earthquake, the U.S. Geological Survey (USGS) and other scientists conclude that there is a 62 percent probability of at least one magnitude 6.7 or greater quake, capable of causing widespread damage, striking the San Francisco Bay region before 2032.
  - O Preliminary estimates by DWR (DWR, 2006) indicate potential \$30 billion to \$40 billion statewide loss from a large earthquake causing significant levee failures and island flooding. Such an event could lead to multi-year disruptions in water supply, water quality degradation, and permanent flooding of multiple islands. Much of this cost comes from the

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- realization that a significant portion of the state's water supply would be vulnerable to massive levee failures.
- O Since the CALFED ROD, there has been a continued POD in the Delta. These are open water organism such as delta smelt and longfin smelt.
- The varied success of implementation of the CALFED Bay Delta Program have caused some to question whether it is possible to achieve all 4 CALFED objectives at the same time.
- The Legislature has acknowledged concern over the Delta with passage of Assembly Bill 1200 in 2005 and in considering additional bills relating to the condition of the Delta.
- o In November 2006, California voters entrusted DWR with about \$5 billion in new bond funds for flood management, a portion of which will be available for the Delta
- The Delta Risk Management Strategy work was initiated to evaluate the risks associated with levees in the Delta and Suisun Marsh and evaluate ways to reduce that risk. Initial results of DRMS show a substantial risk of Delta levees failing from a range of potential hazards.
- The Delta Vision initiative was initiated to devise a strategy for the Delta and Suisun Marsh sustainability that considers all services
- The Public Policy Institute of California (PPIC, 2007) evaluated 9 alternatives for the Delta and concluded that 5 promising alternatives deserve more study; all are different than the current Delta system. These revolve around combinations of changes in conveyance and export operations.
- Development of the Bay Delta Conservation Plan, which began in early 2007, will allow for the conservation and management of aquatic species and seek regulatory assurances related to water supply reliability and water quality.
- Recent court action(s) could stop export of Delta water, including about one-quarter of all the drinking water used in California, highlights the continued conflicts between the ecosystem and water supply. [update/ expand for BOs, etc.]
- **Delta Conveyance** Delta levees and Delta water conveyance are the two largest human influenced factors that determine the configuration of the Delta and its hydrodynamics. Given the condition of the Delta ecosystem as evidenced by the POD, the potential for future conditions that further stress the levees and ecosystem, and the unlikely prospect of the Preferred Program Alternative being able to achieve the program objectives, CALFED agencies believe it is prudent to evaluate alternative water conveyance options for the Delta as provided by the ROD. Different options for Delta conveyance may require modification of the levee system. CALFED agencies believe that the evaluation should encompass a

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wide range of options that include alternative diversion locations, features to move the water, and quantities of water exports from the Delta. To provide a complete evaluation, the Preferred Program Alternative identified in the ROD should be one of the options in a fair and unbiased evaluation. The evaluation should include in-Delta modifications to all the other program plans. CALFED agencies anticipate that the evaluation will be conducted at a programmatic level of detail and allow selection of a new or modified Preferred Program Alternative to continue CALFED implementation into Stage 2, approximately the next 10 to 15 years.

• **Prioritize Implementation for Stage 2** – Considering the need to reevaluate the Preferred Program Alternative, there is a compelling need to strategically continue program implementation. The program cannot stop important investments in all programs while waiting for the study, environmental documentation, design and construction Stage 2 facilities to be completed. At the same time as shown by past funding levels, prioritization is needed to make the best use of available funds.

# 4. Stage 2 Direction

As the CALFED program nears the end of Stage 1, establishing a direction for continuing program implementation into Stage 2 becomes essential. A critical activity in the early portion of Stage 2 will be a through evaluation of conveyance options for the Delta. The various program elements such as water quality, ecosystem, and levees are influenced by and depend on the configuration of Delta conveyance. Accordingly, the evaluation will also include alternative in-Delta modifications to each of the of the program elements.

The programmatic evaluation conducted at the beginning of Stage 2 will further refine its priorities and allow preparation of environmental documentation for continued program implementation.

## Stage 2 Duration

It is likely that new major construction and operational changes will be needed in the Delta and upstream to fulfill the needs of CALFED, Delta Vision, Bay Delta Conservation Plan, and other initiatives. These could include a new Delta configuration, conveyance, upstream surface storage, and other facilities. Whatever decision is made for these facilities, it is likely that a decade or more will be required to provide time to study, provide environmental documentation, design, and construct the facilities.

Although the implementation period for Stage 1 was set at 7 years to provide a reasonable period of time for initial implementation and a reasonable period for the system to begin to respond to the implementation, Stage 2 will not be based on a specific number of years. Based on the time required to move from concept through construction of any major facility, CALFED agencies expect Stage 2 to last 10 to 15 years. At the end of Stage 2, the major construction will be completed and the program will move into the operation and maintenance period, Stage 3.

One of the most important considerations for Stage 2 is the recognition that many other actions need to continue while the configuration for the Delta is being set. In essence, Stage 2 is the interim period of time until the new Delta configuration is ready for operation.

#### **Coordination with Other Initiatives**

Given the long duration of Stage 2, CALFED agencies cannot afford to withhold other important investments while waiting for major decisions on Delta construction to be complete, even if some of those investments become less effective after completion of Stage 2. Stage 2 planning and implementation requires coordination with many other initiatives including Delta Vision, Bay Delta Conservation Plan and others. Each of these is expected to provide information and influence the CALFED Stage 2 actions, and the CALFED planning for Stage 2 is expected to influence the other initiatives. For example, the high priority Stage 2 actions listed in the Program Element Focus below can be considered by Delta Vision as that process develops the long term plan for the Delta. Likewise the plan for the Delta Vision plan for the Delta will likely require relocation of some of the CALFED Stage 2 actions or other adjustments to make them compatible.

Therefore, the priority Stage 2 actions listed below should be designed to be as flexible as possible or located so they are likely to contribute with any Delta configuration.

#### **Prioritization**

Based on experience over the past 7 years, future funding will likely not support all the implementation actions that may seem needed at a specific time. Therefore, there is a critical need to prioritize actions so that the available funds are focused on the most important actions. These include not only actions such as new restoration actions, but maintenance and improvement of Delta levees and other program elements. Quantifiable performance measures must be a component for all parts of Stage 2 implementation. Examples of Stage 2 performance measures are shown in the text boxes below.

## **Program Element Focus**

[include an introductory paragraph] The following shows the highest priority actions envisioned for Stage 2.

#### **Program-wide Actions**

Some needed actions cover the entire program. Experience during Stage 1 showed a specific need to do a better job on monitoring and reporting for all the program elements so the CALFED agencies and stakeholders know what is achieved for the investments. The focus of Stage 2 program-wide actions are a follows:

- Completion of Ongoing Work This would include actions which are under construction or for which feasibility, design and permitting have been completed and which would result in stranded investments or sunk costs if the activity was stopped.
- **Monitoring** Develop quantifiable objectives for all program elements that will allow future measurement and reporting of program progress. Monitoring of program actions is critical to evaluating the actions contribution to program goals and providing information on the overall progress of the program.
- Implement and maintain Program Tracking System In cooperation with the implementing agencies CALFED will develop and maintain a program and fiscal tracking system. The purposes of the tracking system will be to provide decision makers with credible evidence of program progress and information upon which to make decisions.
- Initiate Supplemental Programmatic Analysis This action would identify the preferred conveyance alternative which addresses water quality and ecosystem restoration goals. Program elements within the Delta will need to be adjusted to fit with the selected conveyance.
- **Prepare New Site Specific EIS/EIRs** The CALFED agencies will be conducting additional analysis of the existing and alternative conveyance options. This will result in new site specific EIS/EIRs, which reflect the results of the Delta Vision initiative for a long-term vision for the Delta and, possibly the proposed Bay-Delta Conservation Plan, and considering results of DRMS.
- Interagency Coordination and Planning This would include the development of a strategic plan for the Delta and a single blueprint for ecosystem restoration.

This is expected to primarily include revision of the existing single blueprint to account for the selected Delta conveyance and other proposed changes in the Delta landscape/configuration.

- **Delta Conservancy** Establish a Delta wide conservancy to help protect agricultural areas from urban development in the secondary zone with easements and purchases. The Delta Primary Zone is already protected from urban development by state law. However, no such restrictions are in place for the Secondary Zone. Establish urban limit lines and restrict growth in areas with lower levels of flood protection in the Delta.
- Cumulative Impact Analysis Provide funding for the Delta Protection Commission and DWR to analyze potential cumulative impacts over the next 50 years of urbanization in the Delta and on adjacent lands.
- **Environmental Justice** Environmental justice will be included in planning and implementation of all CALFED program elements.

#### **Upstream Ecosystem Restoration Actions**

Some ecosystem restoration actions upstream of the Delta are of high importance

- Battle Creek Implementation of the Battle Creek Watershed Restoration project to benefit winter- and spring-run Chinook salmon and steelhead trout.
- Environmental Water Program Implement the environmental water program as envisioned in the ROD, with emphasis on the Tuolumne River, Deer Creek, and Clear Creek.

Stage 2 Performance Measures:

- ✓ Number of fish screens installed.
- ✓ Winter run salmon escapement.
- ✓ Acres of restored aquatic habitat.
- Acre-feet of water purchased to support salmon spawning with juvenile survival rates.
- **Red Bluff Diversion Dam Improvements** Fund and construct the Red Bluff Diversion Dam improvements to provide for fish passage.
- San Joaquin River Restoration Fund and construct the San Joaquin River Restoration project.

#### **Delta Ecosystem Restoration Actions**

Some ecosystem restoration actions in the Delta are of high importance regardless of the method of Delta conveyance.

- Yolo Bypass Restore floodplain habitat and fish migration through the Yolo Bypass on a publicly owned portion of the bypass.
- Completion of DRERIP The Delta Region Ecosystem Restoration Implementation Plan (DRERIP) will include peer-reviewed Delta-specific

Stage 2 Performance Measures:

- Number of dams/barriers removed for fish.
- Acres of agricultural land protected.
- ✓ Acres of habitat protected/restored.
- ✓ Population levels of protected and invasive species.

restoration actions, tracking approaches, performance evaluations and a framework for adaptive management. The DRERIP process will develop species and ecosystem conceptual models and performance measures.

- Tidal Marsh Acquisition and Restoration Acquisition and restoration of tidal marsh habitats at Blacklock, Hill Slough in Suisun Marsh, Van Sickle Island, Cache Slough, Decker Island, Dutch Slough as well as areas in the West Delta and North Delta are important to benefit delta smelt and other species.
- **Sherman Island and Jersey Island** Partition these islands with cross levees to create habitat, reverse subsidence, increase recreational opportunities, reduce water quality impacts of levee failure, and to protect infrastructure.
- **Terrestrial Habitat Plan** Develop and implement a long-term terrestrial habitat plan that focuses on major river corridors throughout the Delta.
- Implementation of Appropriate Actions in the Delta Smelt Action Plan The Delta Smelt Action Plan outlined several actions to improve conditions for delta smelt. Some of these actions are currently being tested and other may prove especially beneficial to the smelt.
- Establishment of a Lower San Joaquin River Floodway Recognizing the success of the Yolo Bypass for flood management and ecosystem restoration, a similar facility on the lower San Joaquin River could significantly improve flood and ecosystem conditions.
- HCP/NCCP(s) Planning Agreement Prepare a Habitat Conservation Plan (HCP) under Section 10 of the Federal Endangered Species Act and a Natural Communities Conservation Plan (NCCP) under the Natural Communities Conservation Planning Act and the California Endangered Species Act for Delta to provide regulatory and funding assurances for integrated implementation of the CALFED Program. This may be accomplished through the Bay Delta Conservation Plan.
- Invasive Species Projects Development of a prevention and rapid response program against invasive species such as the zebra mussel. Continue monitoring of eradication of northern pike at Lake Davis to protect downstream Delta fishes.

#### **Environmental Water Account (EWA) Actions**

• Short-term EWA – The EWA is nearing the end of is authorized use. Expectations are that the Bay Delta Conservation Program (BDCP) will include several EWA like measures, but won't be completed for 3 to 4 years. In the meantime, implementing agencies are considering continuing with actions similar

to the existing EWA. Actions envisioned for the remain to be defined but may include:

- 500 cfs EWA pumping at Banks Pumping Plant
- EWA can pump excess water out of the Delta
- Stage 2 Performance Measures:
  - ✓ Acre-feet of water used to support declining fish populations, and to compensate for variability in water supplies.
  - ✓ Volume of pumping, and carryover storage.
- o If capacity, state can pump  $\frac{1}{2}$  of CVPIA B(2) water for EWA and  $\frac{1}{2}$  for SWP
- o Carryover storage in San Luis of 100,000 acre-feet

- Upfront payment for 60,000 acre-feet of water from Yuba County Water Agency as part of the Lower Yuba River Accord until 2015
- Other water purchases
- Long-term EWA or Other Protections Develop and implement a long-term EWA or other protections in coordination with actions proposed in the BDCP and Biological Opinions that provides variable assets and variable triggers that could be used to meet different needs in different years. Some years may require less EWA intervention and other years may require more. The goal is to provide an appropriate operations plan/agreements (EWA or other) in consultation with the fish agencies to minimize the take of threatened and endangered species at the export facilities.
- **Periodic Technical Review** EWA implementing agencies, in collaboration with the CALFED Science Program (including the Interagency Ecological Program), will continue to pursue the collection, synthesis and application of scientific information relevant to the biological needs and population dynamics of anadromous and Delta fish species and factors affecting the health and function of the Bay-Delta ecosystem and the use of EWA or other protections. The next EWA evaluation is expected to be completed by July 2007.

#### **Water Quality Actions**

Given the long-lead time until the selected Delta conveyance can be constructed, several actions are worth pursuing in the Stage 2 interim period. Most of these high priority actions can continue to provide benefit or can be modified for continued benefit after Stage 2 is completed.

• **Delta Cross Channel Re-operation** – Re-operation of the Delta Cross Channel show significant potential for improving Delta water quality while protecting fish. USBR, DWR and other agencies will evaluate Delta Cross Channel (DCC) gate operational strategies to improve central and south Delta water quality while improving protection fisheries through the Delta. The USBR is the lead agency for this project. Recommendations for DCC reoperation strategy are expected to be completed by July 2008.

#### Stage 2 Performance Measures:

- ✓ Water quality at intakes –levels of bromide and organic carbon.
- ✓ Water quality at tap measurements of byproducts, salinity, pathogens, taste and odor, against standards.
- Measurements of toxicity, mercury and methyl mercury within aquatic environments;
- Conduct a pilot study to provide real-time data and implement a new operations plan for the gates.
- Franks Tract Pilot Feasibility and Design Hydrodynamic studies have indicated that actions taken at Franks Tract could potentially result in significant reductions of Delta salinity and bromide at Delta drinking water intakes. DWR has begun the environmental documentation for the pilot test, with the design phase to be completed by 2008 or 2009.
- Build Franks Tract Pilot and Monitoring If a pilot test of Franks Tract is found feasible, it will be constructed and monitored for approximately two years to verify previous studies and improve modeling tools. A full-scale project would be pursued if monitoring shows the pilot project is successful, and modeling

indicates that a full-scale project has significant and economically viable water quality benefits. The goal would be to design a facility that can be flexible enough to be operated for different objectives depending on the ultimate configuration of the Delta. The environmental documentation in support for a full-scale project would begin by 2011 or 2012.

- **Drinking Water Treatment Technology Improvements** Research and pilot projects will continue to help meet drinking water quality regulations during Stage 2.
- Improvements in Distribution Systems Integrated Regional Water Management programs will include improvements in water distribution systems and local water quality demonstration projects.
- Watershed Protection Implementation of statewide watershed protection measures will continue to improve source water quality.

#### **Levee Actions**

Given the risk of levee failures, and the resulting consequences on Delta agriculture, infrastructure, and the export water supply, continued investment in Delta levees is critical to success of the CALFED program. Delta Vision may define a Delta

configuration that requires directing these actions more

to certain areas.

• Maintenance and Subventions – The Levee Subventions program provides funding for levee maintenance and repairs in the Delta. The priority for funding is to preserve and improve local flood protection benefits.

## • Delta Risk Management Strategy (DRMS) -

Any discussion of a long-term, sustainable Delta must take into account the probability that Delta levees will fail and include strategies for reducing those risks. Implementation of risk reduction measures identified in the DRMS study will be a priority in Stage 2.

- Develop a Flood Bypass System for the Lower San Joaquin River As part of the restoration of the San Joaquin River, develop a flood bypass system on the lower San Joaquin River. Given the pressures from urbanization, securing an alignment for the bypass system should be a high priority at the beginning of Stage 2.
- Improve Flood Protection for Existing Urban Areas in the Delta Most of the urbanized areas would not be flooded from sea water during a breaches of Delta levees. However, high population urban areas could be inundated from levee breaches during high inflows to the Delta. Improving those levees is of critical importance to preserving life and property.
- **Subsidence Control** Develop a large-scale project to reverse subsidence and sequester carbon.
- Reuse of Dredge Material Continue technical studies on beneficial reuse of dredge materials and incorporate its use into levee improvements where feasible.

Stage 2 Performance Measures:

high-water events.

levels.

✓ Miles of levee meeting or

✓ Probability of levee failure due to

exceeding PL 84-99 protection

✓ Amount of dredge material reused in levee restoration and repair.

- Complete the Long Term Management Strategy (LTMS) for dredge material and fund appropriate use of dredge material.
- Emergency Response Emergency response in the Delta is currently spread among many organizations. Given the structure of the Delta with access dependent on auto ferries, bridges, and roads on the levees, existing emergency response is difficult. DWR is in the process of preparing an updated Emergency Operation Plan for the Delta which will improve of in-Delta emergency response capability. Implement DWR's EOP including propositioning repair material, etc.

#### Water Supply Reliability Actions

- Surface Storage Evaluations Complete Feasibility and Environmental Analysis of Surface Storage Projects. The planned completion of the feasibility studies and environmental analyses is as follows:
  - North of Delta Off-Stream Storage: August 2008
  - Shasta Lake Enlargement: October 2008
  - Upper San Joaquin Storage Investigation: June 2009
- Surface Storage Funding Secure funding and authorization for surface storage projects once projects have been determined to be feasible. Work with Congress and the Legislature to secure authorization and funding for design and construction of selected projects. Currently, the Governor is calling for

construction of Sites Reservoir in the Sacramento River Basin and storage on the Upper San Joaquin River.

• Construct Permanent Operable Gates in South Delta – DWR and the USBR propose to dredge Delta channels and construct permanent operable gates to ensure water of adequate quantity and quality to agricultural diverters within the South Delta. DWR has

#### Stage 2 Performance Measures:

- Volume of water exported to support beneficial uses including water quality, fish restoration and agriculture.
- ✓ Volume of groundwater and surface storage.
- ✓ Volume of conserved and recycled water.

been installing and removing the temporary barriers in the south Delta and will continue to do so until the permanent operable gates are installed and operational. Three barriers -- Old River at Tracy, Middle River and Grantline Canal barriers -- are installed to improve water quality and water levels for local diversions. A barrier at the head of Old River is installed to improve fish migration. Construction is expected to be completed and operation is expected to commence by April 2009. The operable gates provide flexibility over the existing temporary rock barriers.

- Conveyance Select a Preferred Alternative for Delta water conveyance and complete permitting, design and construction. This includes modification of other program elements to make them compatible with and to complement the selected conveyance.
- Surface Storage Re-operation Case Study Authorize feasibility study, design and implementation for a surface storage re-operation case study on the Cosumnes River to improve flood protection, increase water supply reliability and improve habitat conditions, including floodplain habitat and in-streamflow.

- Water Use Efficiency and Recycling Continue statewide water use efficiency and recycling programs, providing technical assistance, incentive grants for non-locally cost effective measures and monitoring for agricultural and urban water conservation, water recycling and desalination opportunities and establish a certification program. By 2020 these actions are expected to yield annual urban water conservation savings of 1.7 million acre-feet, annual agricultural water savings of 120 thousand to 220 thousand acre feet conservation (irrecoverable flows) and 630 thousand acre-feet of instream flows (recoverable), and annual water recycling of 800 thousand to 1.2 million acre-feet over 2008 levels.
- Water Transfers Continue the Water Transfers Office, which acts as a clearinghouse and provides public information for water transfers. The program will also provide technical assistance to local and regional entities, while protecting third parties and the environment.
- Watershed Protection Watershed program will shift from capacity building to implementation of the implementation of watershed management plans, with priority on the watersheds that are the largest contributors of water to the Delta.
- Integrated Regional Water Management (IRWM) Provide grant funding and technical assistance for development and implementation of IRWM plans by local and regional entities. Coordinate and improve data collection and management, develop performance measures and improve analytical tools to guide implementation of IRWM.

#### Science Actions

- Interagency Ecological Program (IEP) Coordination The Science Program and IEP staff will continue to work to more clearly define their relationship and coordinate their activities. This will include the hiring of a Chief Scientist for IEP who will report to the CALFED Lead Scientist and work cooperatively to develop a program which synthesizes information and expands the understanding of the Bay-Delta system.
- **Directed Research** CALFED Science Program should continue focused research on Delta issues to narrow uncertainty so the best information is available when it is time to select a method for Delta conveyance. For example, the research will initially be focused on such items as resolving the POD, in contributing to tidal marsh design, and subsidence reversal.
- Independent Science Board (ISB) The Science Program has supported the ISB since its inception in 2003 and as a key component in ensuring continuous advancement of credible scientific information for guiding management decisions in the CALFED Program.
- Technical Review Panels and Workshops The Science Program will continue
  to convene Technical Review Panels and issue workshops as specific needs are
  identified by the Lead Scientist, the CALFED Program managers or
  implementing agencies.

Stage 2 Performance Measures:

## 5. Recommendations

Based on the assessment of Stage 1 and the focus for Stage 2, CALFED agencies have the following recommendations:

- 1. **Prepare Programmatic Analysis** CALFED implementing agencies should immediately begin a programmatic analysis of the CALFED Preferred Program Alternative that specifically focuses on alternatives for Delta conveyance and its relationship to the CALFED objectives.
- 2. **Prepare Site Specific EIS/EIR(s)** CALFED agencies should prepare new site specific EIS/EIRs to reflect proposed changes within the Delta identified in the programmatic analysis.
- 3. **Conduct Focused Research** CALFED Science Program should continue focused research on Delta issues to narrow uncertainty so the best information is available in making decisions regarding the Delta.
- 4. **Proceed with Priority Stage 2 Implementation** CALFED agencies should refine the priorities for Stage 2 presented in this report and revise program plans so appropriate, high priority, implementation can progress for all program elements during the interim period, until the selected Delta conveyance method is constructed.